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### **REMARKS**

This amendment responds to the Office Action dated June 20, 2003. Claims 1-13 remain pending. The specification has been amended to change the British spelling of characterized to the American version. Claim 2 has been amended to correct an antecedent basis informality noted by the Examiner. Claims 4-5, 7 and 11 have been amended to be in independent form. Claim 5 has been further amended to remove an ambiguous term noted by the Examiner. Claim 13 has been amended in accordance with the Examiner's remarks with regard to the rejection under 35 U.S.C. § 112, ¶ 2 to clarify the relationship of the various elements of the claim. Claim 13 has been further amended to change the British spelling of characterized to the American version.

### **CLAIMS SATISFY 35 U.S.C. § 112, ¶ 2**

The Examiner rejected claims 1-13 under 35 U.S.C. § 112, ¶ 2 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

The Examiner states that it is unclear whether the gas diffusion means includes the gas space under the cap. It should be observed that the working electrode support 21 in the example embodiment functions as gas diffusion means, as explained on page 16, second paragraph. Thus, the exemplary embodiment includes diffusion means that enclose a large part of the volume around the working and counter electrodes. As such, the Applicants respectfully submit that this claim is not unclear as written.

With regard to the remaining remarks of the Examiner under this rejection, however, the Applicants amended claims 1-13 in accordance with the Examiner's remarks. The Applicants respectfully submit that claims 1-13 particularly point out and distinctly claim the subject matter contained therein, and as such satisfy 35 U.S.C. § 112, ¶ 2. Reconsideration and withdrawal of the rejection of claims 1-13 is therefore respectfully requested.

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# **CLAIMS 1-3, 7-10 ARE PATENTABLE OVER ASTON ET AL.**

The Examiner rejected claims 1-3 and 7-10 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5395507 to Aston et al. [hereinafter "Aston et al."]. Essentially, the Examiner contends that Aston et al. discloses all of the elements of the claims at issue. The Applicants respectfully disagree with the Examiner's characterization of this reference vis-à-vis the claims at issue.

It is clear that the problem of providing both gas to the counter electrode, and electrolyte to the volume between the working electrode and the counter electrode has been known for some time. Various solutions have been proposed as evidenced by the various documents cited in the background of the invention section of the present Application, and the four documents highlighted by the Examiner. In all the time that this problem has been known, no one has previously come up with the idea of providing the claimed features. The inventive idea of the present Application is the provision of wick means providing a path for the electrolyte to pass from the reservoir, around the first part or parts of the outer periphery of the counter electrode; and gas diffusion means for providing a path for gas to diffuse to or from a second part or parts of the outer periphery of the counter electrode. The combination of these features has enabled the development of a sensor, never previously envisaged, with the advantages of good supply both of electrolyte to the volume between the counter electrode and the working electrode, and gas to the counter electrode. Nothing in the prior art teaches this. The number of different designs of sensors in the field that have not incorporated the claimed solution points towards the inventiveness of the invention claimed in claims 1 and 13.

For example, Aston et al. does not disclose the feature of a gas diffusion means providing a path for gas to diffuse to or from a second part or parts of the outer periphery of the counter electrode. Firstly, it is noted that the support tape of reference electrode 29 in

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Aston et al. is not exposed at its outer edge nor is there a "gas space" around the periphery of the reference electrode. As is standard in the art, the various figures are exploded views. When formed into a sensor, the various layers will be pressed together, much as illustrated in Figures 3 and 4 of the present Application. It can be seen from Figures 2 and 4 of Aston et al. that the outer periphery of the reference electrode's support 29 is in contact only with electrolyte-soaked separators 10, 27 made of a hydrophilic material. Oxygen molecules would need to dissolve into the liquid phase to reach the reference electrode and so this is no gas diffusion means in contact with a periphery of the reference electrode. Oxygen transport to the reference electrode in Aston et al. is predominantly by dissolution and diffusion in the liquid phase by pathway analogous to pathway 200 or 210 illustrated in Figure 1 of the present Application.

Moreover, the Applicants respectfully disagree with the Examiner's assertion that any portion of the edge of the counter electrode can be considered a "first part that provides the electrolyte path", and that any other portion of the edge can be considered as "the second part that functions as the gas diffusion portion." A particular part of the edge of the counter electrode cannot function as both the first part and the second part using known materials. For example, a hydrophilic separator, saturated with electrolyte, can form the electrolyte path. In order to pass through this liquid, oxygen would need to dissolve, and diffuse through the liquid. Thus, a hydrophilic separator will function as a first part, but not as a second part. Similarly, a gas diffusion means, such as a porous hydrophobic tape, allows molecules to diffuse in the form of a gas. If the gas diffusion means is a hydrophobic tape, then electrolyte cannot pass through the tape. Thus, hydrophobic tape (for instance) will function as the second, gas diffusion part, and not as the first part providing the electrolyte path.

Thus, it can be concluded from the fact that Aston et al. illustrates a sensor that is circularly symmetric around the periphery of the counter electrode that Aston et al. cannot possibly disclose a sensor having two separate first and second parts as the periphery of the

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counter electrode. As such, Aston et al. fails to anticipate claims 1-3 and 7-10. Reconsideration and withdrawal of the rejection of these claims is therefore respectfully requested.

**CLAIMS 1, 2, 7, 8 AND 10 ARE PATENTABLE OVER CAMPBELL ET AL.**

The Examiner rejected claims 1, 2, 7, 8 and 10 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent NO. 4,525,704 to Campbell et al. [hereinafter "Campbell et al."]. Essentially, the Examiner contends that Campbell et al. discloses all of the elements of the claims at issue. The Applicants respectfully disagree with the Examiner's characterization of this reference vis-à-vis the claims at issue.

In Campbell, the reference electrode 36 and the counter electrode 38 are mounted on a membrane 34, the properties of which are not discussed. In the further embodiment of Figure 3, it is stated that they are mounted on a porous PTFE membrane 48. It is not stated whether this membrane is hydrophobic, or hydrophilic or neither.

However, it can readily be deduced that, in order to supply electrolyte to the reference and counter electrodes, from the reservoir, the membrane supporting the reference and counter electrodes must be hydrophilic to allow electrolyte to pass therethrough. The liquid saturated support cannot and does not provide gas diffusion means.

The hydrophilic wick 55 referred to by the Examiner connects buffer reservoir 44 with support member 30 and does not appear to be the main source of electrolyte to the space between the counter electrode and working electrode. This Patent does not discuss gas access to the reference electrode or counter electrode at all, only the diffusion of air through the porous membrane 22 (column 3, line 30). Thus the configuration shown in Campbell et al. is unsatisfactory as no gas access to the counter electrode is provided.

As such, Campbell et al. fails to anticipate claims 1, 2, 7, 8 and 10. Reconsideration and withdrawal of the rejection of these claims is therefore respectfully requested.

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**CLAIMS 3 AND 9 ARE PATENTABLE  
OVER CAMPBELL ET AL. AND ASTON ET AL.**

The Examiner rejected claims 3 and 9 under 35 U.S.C. §103(a) as being unpatentable over Campbell et al. in view of Aston et al. Essentially, the Examiner contends that Campbell discloses all of the elements of the claims at issue, except for calling for the counter electrode to be sandwiched by wicking layers (as per claim 3) and for calling the electrode support tape to be made of PTFE (as per claim 9). The Examiner then cites Aston et al. as providing one of these missing elements. The Examiner further contends that it would have been obvious to one of ordinary skill in the art to adopt sandwiching wicking layers for the counter electrode as taught by Aston et al. so as to enhance the electrolyte wetting of the counter electrode. With regard to claim 9, the Examiner fails to cite any reference as providing PTFE support tape for gas diffusion electrodes, but merely states that the PTFE is the most common material used for gas diffusion electrodes and that the incorporation of known features from analogous prior art functioning is expected within the skill of the art. The Applicant respectfully disagrees with the Examiner's characterization of these references vis-à-vis the claims at issue.

Reconsideration and withdrawal of the rejection of claims 3 and 9 is therefore respectfully requested.

**CLAIMS 4-6 AND 11-13 ARE PATENTABLE**

The Examiner's finding that claims 4-6 and 11-13 are allowable over the prior art if placed in independent form and if the rejection under 35 U.S.C. § 112, ¶ 2 is overcome (is gratefully acknowledged. Claims 4-6 and 11-13 have been amended to place them in independent form. As discussed above, claims 4-6 and 11-13 have been amended in

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accordance with the Examiner's remarks to overcome the rejection under 35 U.S.C. § 112, ¶ 2, hence these claims are now in allowable form.

### CLAIMS ARE PATENTABLE OVER PRIOR ART

The Examiner cites U.S. Patent No. 5,632,875 to Chapples et al. [hereinafter "Chapples et al."] as providing a sensor similar to that of Aston et al. But, Chapples et al. does not disclose wick means for providing a path for electrolyte to pass from the reservoir, around the first part of the outer periphery of the counter electrode to provide electrolytic continuity between the counter electrode and the working electrode, as require by Claim 1. Electrolyte enters the space between the working electrode and the counter electrode through aperture 30 in the counter electrode, shown in Figure 6 and discussed in column 4, from line 32. This is in direct contrast with the claimed electrolyte supply path.

The Examiner cites U.S. Patent No. 5,635,627 to Bytyn as disclosing a sensor with electrodes that have support tapes extending beyond the catalyst portions, and refers to Figure 2. But Bytyn includes a gas diffusion means providing a path for gas to diffuse to or from a part of the outer periphery of a counter electrode. However, similarly to Chapples et al. there is no wick means providing a path for electrolyte to pass from the reservoir, around the first part or parts of the outer periphery of the counter electrode. Again, electrolyte is supplied to provide electrolytic continuity between the counter and working electrode, only by means of an aperture though annular electrodes. Thus, claims 1 and 13 are novel over all of the cited references, none of which includes both the wick means for providing a path for electrolyte to pass from the reservoir, around the first part or parts of the outer periphery of the counter electrode; and gas diffusion means providing a path for gas to diffuse to or from a second part or parts of the outer periphery of the counter electrode.

**CONCLUSION**

The Applicants respectfully submit this application is in condition for allowance and request issuance of a Notice of Allowability.

In the event the prosecution of this application can be efficiently advanced by a phone discussion, it is requested that the undersigned attorney be called at (703) 435-9390.

**FEES**

If additional amounts are due following the amendments made to the claims above, or for any other reason, it is respectfully requested that the PTO charge any deficiency or credit any overpayment to the deposit account of Mayer Fortkort & Williams PC, Deposit Account, #50-1047.

Respectfully submitted,

By   
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Date: October 20, 2003

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